

SECTION 26 24 24

CIRCUIT BREAKERS AND PANELBOARDS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Enclosed circuit breakers.
- B. Panelboards and load centers.

1.02 RELATED SECTIONS

- A. Motor control centers are specified in Section 26 24 19 – Motor-Control Centers.

1.03 MEASUREMENT AND PAYMENT

- A. General: Circuit breakers and panelboards, as specified herein, will not be measured separately for payment but will be paid for as part of the Contract lump-sum price for Electrical Work as indicated in the Bid Schedule of the Bid Form.

1.04 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM B187 Specification for Copper Bar, Bus Bar, Rod and Shapes
- B. National Electrical Manufacturers Association (NEMA):
 - 1. NEMA AB 1 Molded Case Circuit Breakers and Molded Case Switches
 - 2. NEMA PB 1 Panelboards
- C. Underwriters Laboratories Inc. (UL):
 - 1. UL 50 Enclosures for Electrical Equipment
 - 2. UL 67 Panelboards

1.05 REGULATORY REQUIREMENTS

- A. Refer to Section 20 70 26 - Common Materials and Methods for Electrical Systems, for requirements.

1.06 SUBMITTALS

- A. General: Refer to Section 01 33 00 - Submittal Procedures, and Section 01 33 23 - Shop Drawings, Product Data, and Samples, for submittal requirements and procedures.

- B. Product Data: Submit manufacturers' product data for specified equipment and materials. Include the following information for each item:
 - 1. Manufacturer's model number or item identification;
 - 2. UL listing and rating;
 - 3. Critical dimensions and mounting arrangement; and
 - 4. Replacement parts list.
- C. Shop Drawings: Submit Shop Drawings and electrical diagrams as follows:
 - 1. Enclosures: Drawings showing materials and methods of construction, door arrangement, conduit hub and knockout locations, and identification of intended panelboard or load center.
 - 2. Circuit Breakers: Drawings showing circuit for which intended, voltage ratings, insulation level, current rating, and interrupting ratings.
 - 3. Panelboards and Load Centers: Drawings showing base material, general arrangement, location, and identification of each circuit breaker and the circuit breaker information specified above, location and identification of terminals, location of barriers, applicable UL 67 Tables A through F information, wiring diagrams, and identification of the enclosure for which intended.
- D. Test Reports: Submit copies of certified reports of factory and field tests performed in accordance with the applicable referenced standards and specification requirements.

1.07 QUALITY ASSURANCE

- A. Select a manufacturer who has been regularly engaged in the manufacture of similar equipment and has met UL requirements.
- B. Conform to NEMA AB 1, NEMA PB 1, and California Electrical Code, as applicable.
- C. Components of the same type, size, rating, functional characteristics, and manufacture shall be interchangeable.

1.08 DELIVERY, STORAGE AND HANDLING

- A. Provide markings on each circuit breaker, panelboard, and load center in accordance with the referenced standard. Each item shall be UL labeled.
- B. Ship each unit securely wrapped, packaged, and labeled for safe handling in shipment and to avoid damage or distortion.
- C. Store circuit breakers, panelboards, and load centers in secure and dry storage facility.

PART 2 - PRODUCTS

2.01 EQUIPMENT

A. Enclosed Circuit Breakers:

1. Provide NEMA AB 1, molded case, quick-make quick-break bolt-on type, with thermal-magnetic type overload trip, interchangeable unit for frame rated 125 A and above. Breakers shall include the following requirements as indicated:
 - a. Number of poles;
 - b. Rated voltage and continuous current;
 - c. Rated interrupting current; and
 - d. Trip setting.
2. When circuit breakers are located in spaces other than the main electrical distribution system equipment rooms and used to protect conductors serving emergency equipment motors (such as fans, dampers, and pumps), emergency lighting, and communications equipment, they shall not be tripped by the thermal element. Thermal element contact shall be used to indicate an alarm condition.
 - a. Circuit breakers for tunnel lighting and power panel shall have auxiliary contacts. These contacts shall be paralleled to provide a common "panel trouble" alarm locally and to Central Control.

B. Panelboards and Load Centers: NEMA PB 1 or UL 67, with the following additional requirements:

1. Enclosure: NEMA 12 or UL 50 fabricated from galvanized steel, surface-mounted unless otherwise indicated, tamperproof, with the following additional requirements:
 - a. Gutter size:

<u>Main Bus Rating Amperes</u>	<u>End Gutter Size (Inches)</u>	<u>Side Gutter Size (Inches)</u>
225 and below	6	5
400 and over	8	8
 - b. Provide interior components mounted on backplate of reinforced steel for rigid support and accurate alignment.
 - c. Provide device or mechanism for enclosure grounding.
2. Hardware and Trim:
 - a. Panelboards shall be designed for surface or flush mounting as indicated, and shall contain a hinged door fitted with a combination latch and door lock, accommodating a master key. Provide one flat key tumbler cylinder-type, nickel-plated door lock conforming to the station masterkey system, two keys per lock.
 - b. Nameplates or other permanent identification shall be provided for each circuit breaker, which shall mount adjacent to the individual circuit breakers. A directory

frame with acrylic plastic face and printed directory, 8-1/2 inches by 11 inches, shall be provided and mounted on the back of the door.

- c. Flush-mounted panelboards shall be provided, with means to plumb and align the front of the panel with respect to the adjacent finished surfaces.
 - d. Unless otherwise specified, finish shall be a metallic surface thoroughly cleaned, degreased, primed with an approved corrosion-inhibitive primer, and then finished with heavy-duty, industrial-grade polyurethane enamel.
3. Bus Bars: ASTM B187, 98 percent conductivity copper, with silver-plated contact surface, and the following additional requirements:
- a. Provide neutral bus of the same rating as that of phase bus.
 - b. Provide main lugs or main circuit breaker of rating as indicated.
 - c. Provide a grounding bus.
4. Nameplates: Provide nameplates showing panelboard number. Nameplates shall conform to the requirements of Section 20 70 26 - Common Materials and Methods for Electrical Systems

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install panelboards and load centers at locations indicated with the top 6 feet, 6 inches above the floor and the bottom not less than 12 inches above the floor, unless specifically indicated otherwise. Use multi-sectional panelboards and load centers to meet these spacings if necessary. Line up tops of trims to present neat appearance.
- B. Mount panelboards and load centers in place with front straight and plumb, and anchor in accordance with applicable requirements of the California Building Code.
- C. When a feeder serves more than one panelboard or panelboard section, install a separate junction box or provide adequate gutter area for termination of feeders and bus taps.
- D. Provide circuit breakers of proper ratings for all branch circuits. Connect branch circuit wires as indicated. Connect neutral wires of branch circuits to the neutral bar of the same panelboard as the branch circuit.
- E. Make conduit connections in accordance with Section 20 50 13 - Raceways for Facility Services
- F. Make cable connections in accordance with Section 26 05 24 - Low and Medium Voltage Wires and Cables.
- G. Ground panelboards and load centers in accordance with Section 26 05 26 - Grounding and Bonding for Electrical Systems.

- F. Bus connections shall be made only by means of machine screws into threaded holes, or with through-bolts with washers and nuts. Connections shall be provided with lockwashers for mechanical locking.

3.02 DIRECTORY OF CIRCUITS

- A. Provide each panelboard and load center with a typewritten circuit directory located on the inside of the enclosure.

3.03 FIELD QUALITY CONTROL

- A. Perform the following tests under observation of the Engineer, and submit certified test reports of all tests. Furnish equipment and instruments required to perform the tests.
 - 1. Test circuits for connections in accordance with the wiring diagram.
 - 2. Test that insulation resistance to ground of non-grounded conductors is a minimum of ten megohms.
 - 3. Test panelboard and load center enclosures for continuity to the grounding system.
 - 4. Test operation of circuits and controls. When testing, operate each control a minimum of ten times and each circuit continuously for a minimum of 1/2-hour.
 - 5. Test that each panel has a balanced load.
 - 6. Maintain a log of all tests.

END OF SECTION 26 24 24